

Research on Innovation of Oil and Gas Asset Valuation Accounting Based on Perspective of Subject Integration

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ABSTRACT

Oil and gas assets are the core assets of oil and gas companies. Due to the particularity of the oil and gas industry, such as high investment, high risk, and mismatch of investment and income, the valuation of oil and gas assets, the determination of transfer income and the disclosure of information have become the three major problems in accounting academic research. This paper uses standardized research methods, literature review methods, and comparative analysis methods to conduct systematic research from three aspects: the composition boundary of oil and gas assets, the concept of reserve capitalization, and the method of reserve value evaluation, in order to clarify the connotation of oil and gas assets. It uses structure, scope and value measurement methods from the perspective of innovative research on cross-discipline integration, discussing the solution of accounting problems of oil and gas asset valuation, and tries to provide a valuable reference for China's oil and gas accounting standards and international convergence.

Keywords: Oil and Gas Assets, Asset Valuation, Value of Oil, Gas Reserves.

1. LITERATURE REVIEW

The United States has established the most complete oil and gas accounting standards system in the world. In 1975, the U.S. enacted the Energy Policy and Protection Act, which required oil and gas companies to use uniform accounting standards to submit reports to the U.S. Department of Energy and required the U.S. Securities and Exchange Commission (SEC) or the Financial Accounting Standards Board (FASB) authorized by it to submit reports to the U.S. Department of Energy and be responsible for the formulation of relevant standards. In 1977, the American FASB in the Financial Accounting Standards Announcement No. 19 (SFAS 19) required oil and gas companies to calculate the upstream business according to the results method and report the number of reserves and capitalized costs of oil and gas assets and related data such as incurred costs [1]. However, because the adoption of the result method of accounting affects the interests of the majority of small and medium oil companies in the U.S., the SEC's Accounting Research Report No. 253 (ASR) issued in 1978 pointed out that oil and gas

companies can use the full cost method as an alternative method. Because the results method and the total cost method are based on historical costs, they cannot reflect the potential value of oil and gas companies, and the relevance of accounting information is very low. Therefore, a new method based on the future value of assets — reserve recognition is proposed, which is called Law RRA [2]. After that, the SEC issued ASR Nos. 257 and 258. FASB issued SFAS No. 25 in 1979 and announced the final result: oil and gas companies can choose any of the results method and the full cost method to use and require RRA as a supplementary report content [3]. In 1982, the FASB proposed standardized measurement of proven oil and gas reserves (SMOG) in the Financial Accounting Standards Announcement No. 69 (SFAS 69). SMOG added consideration of future income tax on the basis of RRA and did not require to provide a value-based income statement, but there is no essential difference between the two [4]. So far, the "historical cost + reserve value" pricing basis has been established and has been used in the U.S. till now.

CAS 27, issued by the Ministry of Finance of the People’s Republic of China in 2006, adopted the results method for accounting and required reports on the number of reserves and all expenditures for the acquisition of mining rights and interests, exploration and development. But there is no information about the disclosure of the value of the reserves [5-7]. Scholars such as Wu Jie and Sun Jiakui believe that the reporting items of China’s CAS No. 27 Standard are too simple compared to the SFAS No. 69 Standard. It is difficult to reflect all the value information of oil and gas assets, such as the number of reserves, depreciation or depletion accrued, and the amount of depreciation reserves [8-10]. Dong Yalan modifies the net present value method by introducing option theory and constructs a real option-based oil and gas reserve value evaluation model [11].

A review of the above literature shows that there are currently two main measurement and reporting modes for oil and gas assets. They are based on historical cost and supplementary disclosure of the number of reserves and historical cost plus the value of reserves, and supplementary disclosure of the number of reserves. The measurement of oil and gas assets is related to oil and gas assets. The definition and the discussion of the value of reserves are still controversial.

2. COMPARISON ON PRICING METHODS OF PETROLEUM AND NATURAL GAS ASSETS BETWEEN CHINA AND THE UNITED STATES

2.1. Summary of U.S. Oil and Gas Assets Valuation Methods

SFAS 19 selects historical cost as the basis for the valuation of oil and gas assets and requires oil and gas companies to disclose the number of reserves in the off-balance sheet. ASR 253 proposes a new accounting method based on the value of reserves. In SFAS 25, historical cost is still used as the pricing basis, and the number of reserves is disclosed. SFAS 69 stipulates an information disclosure method based on historical cost and supplemented by discounted value, and the basic pricing model of “historical cost + reserve value” is born from this. The current pricing method in the U.S. is that SE and FC are in parallel, and SMOG is disclosed as supplementary information.

2.2. Overview of China’s Petroleum and Natural Gas Assets Valuation Methods

The traditional practice of assets measurement is based on historical costs. The pricing basis currently adopted by China is the model of historical cost pricing plus reserve quantity measurement. CAS 27 stipulates that Chinese oil and gas companies can only use the results method in the accounting treatment of oil and gas assets.

2.3. Comparative Analysis of Chinese and American Standards

2.3.1. Comparative Analysis of Pricing Basis

From Table 1, it can be found that both China and the U.S. have adopted a model of selecting historical costs for oil and gas assets valuation based on the quantity of reserves. The main difference in the pricing basis between China and the U.S. is that the basis for the pricing of the U.S. oil and gas assets also chooses the value of reserves as the supplementary basis. The main reason for this difference is the accuracy of accounting information reflected by measurement attributes.

Table 1. Comparison of pricing basis between China and the United States

China	The U.S.
CAS 27 historical cost + quantity of reserves	SFAS 19 historical cost + quantity of reserves
	SFAS 25 historical cost + quantity of reserves
	SFAS 69 historical cost + quantity of reserves + energy storage value

2.3.2. Comparative Analysis of Pricing Methods

From Table 2, it can be analyzed that in the selection of oil and gas assets valuation methods, both China and the U.S. have adopted SE, but the difference is that the U.S. uses SE and FC as accounting alternatives, and SMOG as supplementary disclosure information. From the perspective of the standardization of oil and gas assets valuation methods and the requirements of the quality of accounting information, the value of oil and gas reserves representing the future earnings of oil and gas companies must be measured and disclosed. The problem of capitalization of oil and gas reserves is the

first to be solved in the study of the three major problems of oil and gas accounting.

Table 2. Comparison of Chinese and American pricing methods

China	The U.S.
CAS 27 SE	SFAS 19 SE
	SFAS 25 SE+FC
	SFAS 69 SE+FC+SOMG

3. DISCUSSION ON ACCOUNTING ISSUES OF OIL AND GAS ASSETS VALUATION

3.1. Feasibility Analysis of Expanding Boundary of Oil and Gas Assets

3.1.1. Necessity of Capitalization of Oil and Gas Reserves

In SFAS 69, the FASB proposed to allow some oil and gas companies to disclose information on proven reserves and related materials related to standardized measurement of proven reserves. These regulations have increased the relevance

requirements of accounting information for oil and gas companies to a certain extent. CAS27 indicates the total value of oil and gas companies. Generally speaking, it is determined by the future cash flow of its own reserves. According to the requirements of reliability and relevance, oil and gas reserves need to be confirmed. Therefore, it is imperative to capitalize oil and gas reserves as oil and gas assets.

3.1.2. Definability of Capitalization of Oil and Gas Reserves

3.1.2.1. Typical Classification of Oil and Gas Reserves

At the 16th World Petroleum Congress, WPC and SPE jointly recommended a new oil and gas reserve classification system standard, which is shown in Figure 1.

The SEC issued regulations on the classification of oil and gas reserves in Regulation SX4-10 (shown in Figure 2). In the standardized measurement of SFAS 69, the FASB selects the remaining economically recoverable reserves to determine the value of the reserves.

And China's reserve classification system is shown in Figure 3.

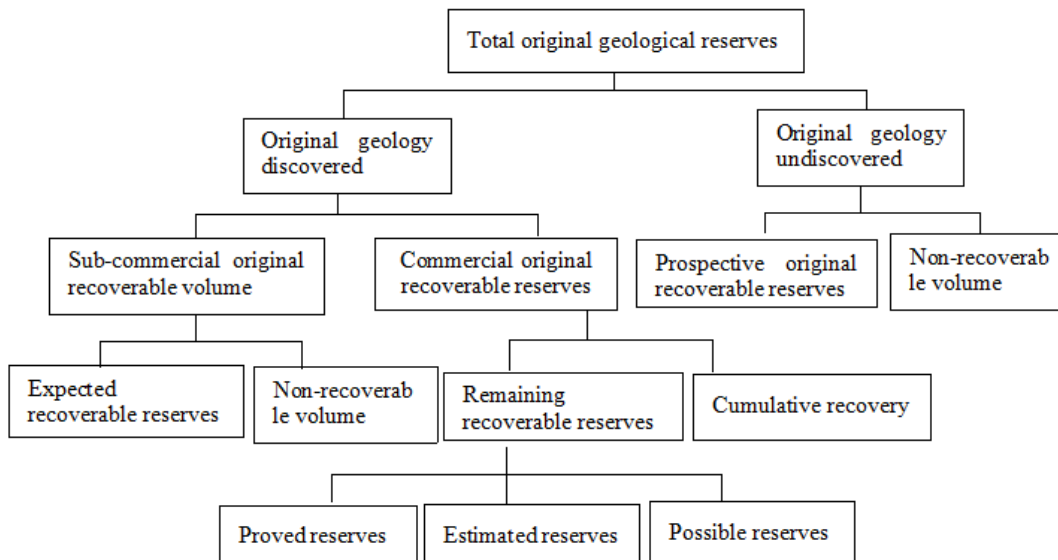


Figure 1 Classification of oil and gas resources by the Society of Petroleum Engineers (SPE) and the World Petroleum Congress (WPC)

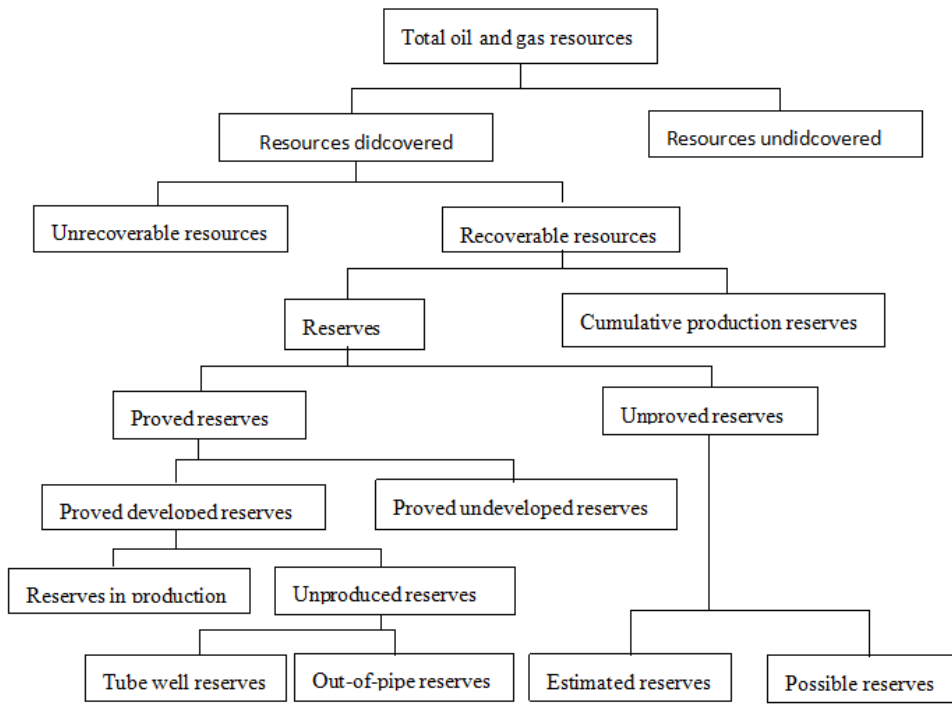


Figure 2 U.S. Securities and Exchange Commission (SEC) Classification of Oil and Gas Resources

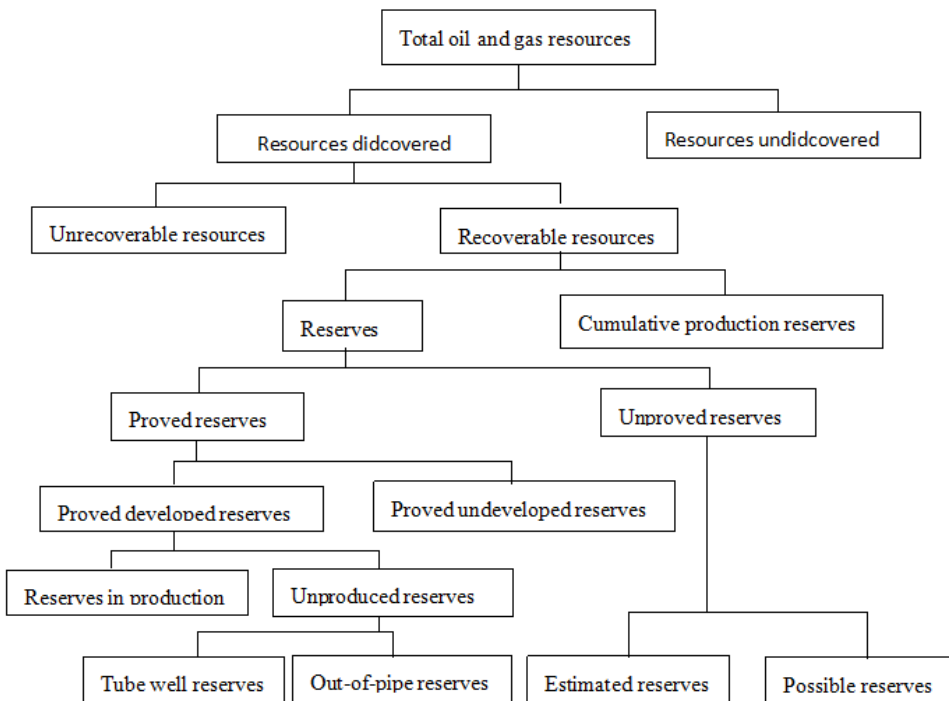


Figure 3 Classification of domestic oil and gas resources and reserves

3.1.2.2. Analysis of Scope and Definability of Capitalization of Oil and Gas Reserves

The classification of reserve assets should select the proven remaining economically recoverable reserves that have been developed. From the perspective of accounting attributes, it is generated by a series of past oil and gas production activities. The cost of its input has a reliable measurement basis and is directly related to the economic benefits of the enterprise. Its connotation meets the requirements of capitalization and meets the definability of assets, measurability requirements, in line with the reliability and relevance of the accounting information quality requirements. Therefore, the proved remaining economically recoverable reserves that have been developed should be included in the oil and gas assets by the classification of oil and gas reserves.

3.2. Discussion on Accounting Measurement of Oil and Gas Reserve Assets

3.2.1. Definition of Measurement Attributes of Oil and Gas Reserves

The measurement attribute is the basis for the confirmation of the element amount. Oil and gas resources have the characteristics of exhaustion and irreplaceability, and fluctuations in the value of their assets. The choice of their pricing basis is very important. In this regard, at the beginning of 2000, the FASB clearly stipulated in SFAC 7 that the fair value should be used to measure reserve assets, and valuation is usually used to determine this value.

3.2.2. Evaluation of Value Measurement Method of Oil and Gas Reserves

In the exploration and implementation of the asset management of oil and gas reserves, Western countries with developed market economies formed a good reserve trading market as early as the 1970s, and their oil and gas reserves evaluation methods were relatively complete. Here the current internationally accepted methods for measuring the value of oil and gas reserves are compared and analyzed.

The cash flow method is a method of value evaluation by calculating the present value of the net cash flow of the entire construction period of the project at a certain discount rate. The SMOG method used in SFAS 69 to measure the value of reserves adopts the net present value method with the discount rate of the internal rate of return. Standardized measurement fully reflects the time value of money, but its single discount rate cannot reflect the time

change of risk. The assumptions and regulations in the calculation process also have a certain impact on the reliability of accounting.

In the early stage of exploration, the proved reserves were uncertain, and future cash flows cannot be estimated based on the reserves. Therefore, when the transfer of oil and gas reserves was involved in this stage, all the exploration expenses from exploration work are from the transfer of mineral rights and closeness to the discovered reserves. The associated exploration risk-related income is used to determine the transfer price. The exploration cost method is advantageous in the transaction of transferring the prospecting rights of leased land, but it is complicated in calculations and diverse in types, which is not convenient for actual operation and unified comparison and ignores the difference in benefits of different exploration activities.

The core of the market pricing method is based on the way oil and gas resources are put on the market. The two parties negotiate to determine the final reasonable price. The advantage of the market pricing method is that it does not require complicated research on reserves and production forecasts, and it is simple and easy to implement. However, in many cases, the evaluation of this method does not involve trade issues.

In summary, the exploration cost method and market pricing method cannot be used alone, which does not meet the requirements of the relevance and reliability of the quality of modern oil and gas companies' accounting information. The net present value method is widely used in the measurement of the value of oil and gas reserves abroad. However, the discount rate calculation in the standardized measurement of reserve value stipulated by the SEC has certain subjectivity. Therefore, it is necessary to improve the calculation method of the SMOG discount rate. It is recommended that the selection of the SMOG discount rate should take the benefits and risks into consideration. It is hoped that the value measurement of oil and gas reserves can be more objective and reasonable.

3.3. Suggestions for Perfecting Value of China's Oil and Gas Reserves

With the continuous development of the market economy, the capitalization of oil and gas reserves in China's oil and gas companies will become more and more important. How to improve its capitalization system is an important research topic.

Firstly, if oil and gas reserves cannot be capitalized objectively, it will be difficult for oil and gas reserves to be traded in the market as a commodity, which will hinder the in-depth reform of the oil and gas industry and the future development of oil and gas companies. Therefore, it is necessary to establish an independent and complete capitalization management system based on the characteristics of oil and gas assets.

Secondly, value management of oil and gas reserves is the prerequisite for capitalization management of oil and gas reserves. To strengthen the value management of oil and gas reserves, it should first start by changing the current situation of only implementing physical management of oil and gas resources. It is necessary not only to establish a quantitative account of oil and gas reserves, but also to establish a corresponding value accounting account to realize the dual management of quantity and quality.

Thirdly, due to its own particularity, the value evaluation of oil and gas reserves is obviously different from that of other assets. The establishment of a formal national oil and gas enterprise asset reserve assessment report system can provide internal and external users of accounting information with reliable and relevant disclosure information to meet the needs of relevant decision-making.

4. CONCLUSIONS

This paper focuses on normative research, combining the characteristics of the oil and gas industry and the basic theories of accounting and measurement. Through a comparative analysis of the valuation methods of domestic and foreign oil and gas assets, it proposes innovative ideas for expanding oil and gas assets, and then expands the composition of oil and gas assets. The accounting measurement of oil and gas reserves and assets has been systematically discussed, and the research in this paper has drawn the following important conclusions.

Firstly, whether it is from the necessity of research or from the definability of assets, it is required that the connotation of oil and gas assets should be expanded to improve the relevance of the quality of accounting information. Oil and gas reserves assets should be included in the composition of oil and gas assets. After the expansion, oil and gas assets should include three parts: wells and related facilities, mining rights and oil and gas reserves assets.

Secondly, based on the international comparative study of reserve classification, the logic of the Chinese and American accounting standards and the matching

of the reserve system classification, the proven and developed remaining economically recoverable reserves are selected as the accounting classification of oil and gas reserve assets when the oil and gas assets are expanded.

Lastly, based on a comparative study of mainstream oil and gas reserves evaluation methods at home and abroad, this paper believes that the net present value method is an objectively applicable measurement method in the current accounting practice. The discount rate should be calculated by comprehensive consideration of income and risk factors in application to increase the reliability and relevance of measurement value of oil and gas reserves. And it is recommended that China also adopts the net present value method to measure and discloses the value of reserve assets in the future.

REFERENCES

- [1] FASB, *Statement of Financial Accounting Standards No.19 - Financial Accounting and Reporting by petroleum and Gas Producing Companies*, 1977.
- [2] SEC, *ASR No. 253 - Publication of Releases Concerning petroleum and Gas Accounting*, 1978.
- [3] FASB, *Statement of Financial Accounting Standards No.25. - Suspension of Certain Accounting Requirements for petroleum and Gas Producing Companies*, 1979.
- [4] FASB, *Statement of Financial Accounting Standards No. 69. - Disclosures about petroleum and Gas Producing Activities*, 1982.
- [5] Ministry of Finance of the People's Republic of China, *Accounting Standards for Business*. Economic Science Press, 2006.
- [6] Ministry of Finance of the People's Republic of China, *Accounting Standards for Business Enterprises No. 27 - Petroleum and Natural Gas Extraction*, 2006.
- [7] J. Geng, S. Liu, Comprehensive Analysis and International Comparison of China's Petroleum and Natural Gas Exploitation Criteria, *Finance and Accounting Monthly*, 17 (2020) 33–38. DOI : 10.19641/j.cnki.42-1290/f.2020.17.006
- [8] J. Wu, Z. Zhang, Comparison of China - the U.S. Oil and Gas Accounting Standards — Recommendations on China's Oil and Gas

Exploration Accounting Standards, *International Petroleum Economy*, 12 (2005) 41–42.

- [9] J. Wu, A Summary of China's Oil and Natural Gas Accounting Research, *Journal of the University of Petroleum (Social Science Edition)*, 2 (2005) 15–20.
- [10] J. Sun, B. Chen, Discussion on Accounting Disclosure of Oil and Natural Gas, *Resources and Industry*, 1 (2008) 105–107.
- [11] Y. Dong, Valuation of Oil and Gas Reserve Assets Based on Real Options, *Business accounting*, 6 (2019) 53–55.